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ABSTRACT

The Diffuse Interstellar Bands
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RECENT PROGRESS IN DIB RESEARCH: SURVEY of PAHS AND DIBS:

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The spectra of several neutral and ionized PAHs isolated in the gas phase at low temperature have been measured in the laboratory under experimental conditions that mimic interstellar conditions and are compared with an extensive set of astronomical spectra of reddened, early type stars [1, 2]. The comparisons of astronomical and laboratory data provide upper limits for the abundances of *specific* neutral PAH molecules and ions along *specific* lines-of-sight. Something that is not attainable from infrared observations alone. We present the characteristics of the laboratory facility (COSmIC) that was developed for this study and discuss the findings resulting from the comparison of these unique laboratory data with high resolution, high S/N ratio astronomical observations. COSmIC combines a supersonic free jet expansion with discharge plasma and high-sensitivity cavity ringdown spectroscopy and provides experimental conditions that closely mimic the interstellar conditions. The column densities of the individual neutral PAH molecules and ions probed in these surveys are derived from the comparison of these unique laboratory data with high resolution, high S/N ratio astronomical observations. The comparisons of astronomical and laboratory data lead to clear and unambiguous conclusions regarding the expected abundances for PAHs of various sizes and charge states in the interstellar environments probed in the surveys. Band profile comparisons between laboratory and astronomical spectra lead to information regarding the molecular structures and characteristics associated with the DIB carriers in the corresponding lines-of-sight. These quantitative surveys of neutral and ionized PAHs in the optical range open the way for unambiguous quantitative searches of PAHs and complex organics in a variety of interstellar and circumstellar environments.

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References

[1] F. Salama et al. (2011) ApJ. 728 (1), 154

[2] F. Salama et al. (2012) Bull. Amer. Astron. Soc. 44 (4), 209